

Exponential Growth & Decay - Notes

■ Definition: An exponential function is one in the form

$$y = a \cdot b^x \quad \text{where } a \neq 0, b \neq 1 \text{ and } b > 0$$

• You know it's exponential when x is the exponent!

a - initial amount / starting point (word problem)

- y-intercept is always $(0, a)$

b - called "growth factor" or "decay factor"

- describes how the initial amount, a , is changing

Ex: $b = 3 \rightarrow$ tripling

$b = 2 \rightarrow$ doubling

$b = \frac{1}{2} \rightarrow$ cutting in half

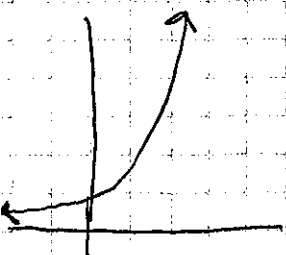
■ Growth or Decay?

\rightarrow to decide, only pay attention to the **b** value!

Growth

$$b > 1$$

• The y -values get bigger (grow!)



Ex: $y = 3^x$

$$y = 2(1.7)^x$$

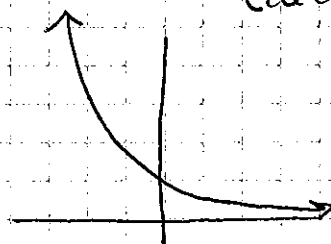
$$y = -5(2)^x$$

$$y = .5(4)^x$$

Decay

$$0 < b < 1$$

• The y -values get smaller (decay!)



Ex: $y = \frac{1}{2}^x$

$$y = 3(0.7)^x$$

$$y = -6\left(\frac{1}{8}\right)^x$$

$$y = .5(0.25)^x$$

Classwork - Growth or Decay

Name _____

Date _____

Block _____

Tell if each of the following exponential functions is growth or decay?

1) $y = 3(5)^x$
growth $b=5 > 1$

2) $y = \frac{1}{3}^x$

3) $y = 0.5(6)^x$

4) $y = 7(0.4)^x$

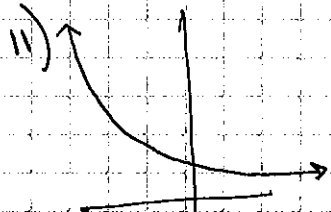
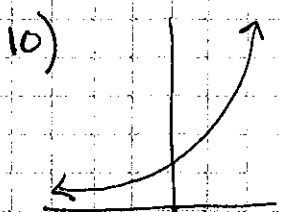
5) $y = -4(12)^x$

6) $y = 8(\frac{1}{4})^x$

7) $y = -(0.3)^x$

8) $y = (\frac{5}{2})^x$

9) $y = 1.8^x$



To decide from a table, just look at if the y-values are increasing (growth) or decreasing (decay).

13)

x	y
-1	36
0	12
1	4
2	4/3

14)

x	y
-1	1
0	2
1	4
2	8

15)

x	y
-1	10
0	5
1	2.5
2	1.25

Now do p. 528 # 8-10 and 27-30 on a separate sheet
* Staple the bookwork to this sheet and turn in!